

MODULE 3

PACKAGING



03-01-10/99

YOU ARE REGULATED IF:



- ☐ Make, sell
- ☐ Inspect, test, retest, repair
- ☐ Rebuild
- ☐ Use to prepare, accept or offer hazardous materials

PACKAGING

This



Not This



DEFINITIONS

How to Use the HMR

Hazardous Materials Transportation Terms

NOTE: See 49 CFR § 171.8 for in-depth definitions

Bulk Packaging

A packaging (transport vehicle or freight container) in which hazardous materials are loaded with no intermediate form of containment, when the internal volume is greater than:

- (1) 450 liters (119 gallons) for a liquid;
- (2) 400 kilograms (882 pounds) for a solid; or
- (3) 1,001 pounds (454 kilograms) for a gas.

Note: A bulk packaging is **not** a vessel or barge.

Product, including its packaging.

A bulk packaging that is loaded or unloaded without being removed from the motor vehicle. (The tank may or may not be permanently attached to the motor vehicle).

§171.8 Definitions and abbreviations.

In this subchapter.

Aerosol means any non-refillable metal receptacle containing a gas compressed, liquefied or dissolved under pressure, the sole purpose of which is to expel a nonpoisonous (other than a Division 6.1 Packing Group III material) liquid, paste, or powder and fitted with a self-closing release device allowing the contents to be ejected by the gas.

Package Packaging



vs.



PACKAGE OR OUTSIDE PACKAGE



**Means:
Packaging plus
Contents**



**Packaging means:
A receptacle and
components necessary
for "containment"
function***

***Minimum HMR packaging requirements**

OFFER PACKAGE ONLY WHEN IN COMPLIANCE WITH HMR

This



Not This



TRAIN ALL HAZMAT EMPLOYEES



- Prepare hazmat for shipping
- Prepare shipping papers
- Perform any function covered by HMR

**Anyone performing HMR-required
packaging functions...**

Must comply with HMR, Part 173

Carrier = Shipper

- Carrier repackages material**
- Carrier "functions" as shipper**
- Carrier MUST comply with HMR**

PACKAGE INSPECTION



Open to inspection by:

- ☐ U.S. DOT
- or
- ☐ Initial Carrier

OFFERER'S RESPONSIBILITIES

- Proper classification (hazard class)
- Description (proper shipping name and ID No.)
- Packaged correctly
- Package marked correctly
- Compliance with Part 178

PACKAGING

§172.101 HAZARDOUS MATERIALS TABLE—Continued

Identification Numbers (4)	PG (5)	Label Codes (6)	Special provisions (7)	(8) Packaging (§173.***)			(9) Quantity limitations	
				Excep- tions (8A)	Non- bulk (8B)	Bulk (8C)	Passenger aircraft/rail (9A)	Cargo air- craft only (9B)
UN2723	II	5.1		152	212	242	5 kg	25 kg
UN2004	II	4.2	A8, A19, A20	None	212	241	15 kg	50 kg
UN2005	I	4.2		None	187	244	Forbidden	Forbidden
UN2853	III	6.1		153	213	240	100 kg	200 kg
UN2950	III	4.3	A1, A19, B108	151	213	240	25 kg	100 kg
UN2010	I	4.3	A19, B100, N40	None	211	242	Forbidden	15 kg
UN1869	III	4.1	A1	151	213	240	25 kg	100 kg
UN1474	III	5.1	A1	152	213	240	25 kg	100 kg
UN1475	II	5.1		152	212	242	5 kg	25 kg

IDENTIFY THE HAZARDOUS MATERIAL

§172.101 HAZARDOUS MATERIALS TABLE

Sym-bols	Hazardous materials descriptions and proper shipping names	Hazard class or Di- vision	Identifica- tion Num- bers	PG	Label Codes	
(1)	(2)	(3)	(4)	(5)	(6)	
	Magnesium chlorate	5.1	UN2723	II	5.1	
	Magnesium diamide	4.2	UN2004	II	4.2	
	Magnesium diphenyl	4.2	UN2005	I	4.2	
	<i>Magnesium dross, wet or hot</i>	Forbidden			.....
	Magnesium fluorosilicate	6.1	UN2853	III	6.1	
	Magnesium granules, coated <i>particle size not less than 149 microns.</i>	4.3	UN2950	III	4.3	
	Magnesium hydride	4.3	UN2010	I	4.3	A
	Magnesium or Magnesium alloys with more than 50 percent magne- sium in pellets, turnings or ribbons.	4.1	UN1869	III	4.1	

PACKING GROUP NUMBER

§172.101 HAZARDOUS MATERIALS TABLE

Hazardous materials descriptions and proper shipping names	Hazard class or Di- vision	Identifica- tion Num- bers	PG	Label Codes	Special provisions
(2)	(3)	(4)	(5)	(6)	(7)
Magnesium chlorate	5.1	UN2723	II	5.1	
Magnesium diamide	4.2	UN2004	II	4.2	A8, A19, A20
Magnesium diphenyl	4.2	UN2005	I	4.2	
<i>Magnesium dross, wet or hot</i>	Forbidden			.....
Magnesium fluorosilicate	6.1	UN2853	III	6.1	
Magnesium granules, coated <i>particle</i> <i>size not less than 149 microns.</i>	4.3	UN2950	III	4.3	A1, A19, B108
Magnesium hydride	4.3	UN2010	I	4.3	A19, B100, N40

PG I = Great Danger

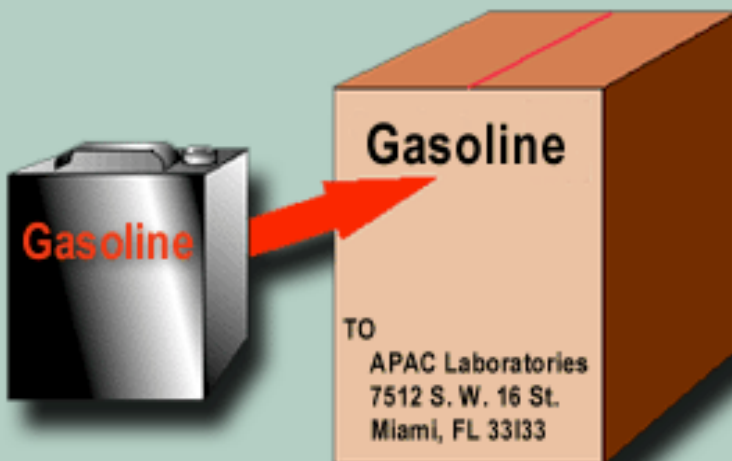
PG II = Medium Danger

PG III = Minor Danger

PACKAGING

Special provisions (7)	(8) Packaging (§173.***)			(9) Quantity limitations	
	Excep- tions (8A)	Non- bulk (8B)	Bulk (8C)	Passenger aircraft/rail (9A)	Cargo air- craft only (9B)

D	Gasohol <i>gasoline mixed with ethyl alcohol, with not more than 20 percent alcohol.</i>	3	NA1203	II	3	
	Gasoline	3	UN1203	II	3	
	Gasoline, casinghead, see Gasoline	.....			.....
	Gelatine, blasting, see Explosive,	.....			.....



LIMITED QUANTITIES (CLASS 3)

Excepted from:

- Labeling (except by air)**
- Spec packaging**
- Placarding**

EXCEPTIONS

§172.101 HAZARDOUS MATERIALS TABLE

Special provisions (7)	(8) Packaging (§173.***)			(9) Quantity limitations	
	Excep- tions (8A)	Non- bulk (8B)	Bulk (8C)	Passenger aircraft/rail (9A)	Cargo air- craft only (9B)
T18	None	201	243	Forbidden	30 L
T18	None	211	242	Forbidden	50 kg
T1	150	202	242	5L	60L
B1, T1	150	202	242	5 L	60 L
T7	153	203	241	60 L	220 L
T7	150	202	242	5 L	60 L
T7	153	203	241	60 L	220 L
T7, T30	150	202	242	5 L	60 L
T1	150	202	242	5 L	60 L
T7	150	202	242	5 L	60 L
T8	150	202	242	5 L	60 L

Non-bulk Packaging

§172.101 HAZARDOUS MATERIALS TABLE

Special provisions (7)	(8) Packaging (§173.***)			(9) Quantity limitations	
	Excep- tions (8A)	Non- bulk (8B)	Bulk (8C)	Passenger aircraft/rail (9A)	Cargo air- craft only (9B)
T18	None	201	243	Forbidden	30 L
T18	None	211	242	Forbidden	50 kg
T1	150	202	242	5L	60L
B1, T1	150	202	242	5 L	60 L
T7	153	203	241	60 L	220 L
T7	150	202	242	5 L	60 L
T7	153	203	241	60 L	220 L
T7, T30	150	202	242	5 L	60 L
T1	150	202	242	5 L	60 L
T7	150	202	242	5 L	60 L
T8	150	202	242	5 L	60 L

Paragraph Headings

§173.150 Exceptions for Class 3 (flammable) and combustible liquids.

(a) *General.* Exceptions for hazardous materials shipments in the following paragraphs are permitted only if this section is referenced for the specific hazardous material in the §172.101 Table of this subchapter and the material does not meet the definition of another hazard class except Division 6.1, Packing Group III or Class 8, Packing Group III.

(b) *Limited quantities.* Limited quantities of flammable liquids (Class 3) and combustible liquids are excepted from labeling requirements, unless offered for transportation or transported by aircraft, and the specification packaging requirements of this subchapter when packaged in combination packagings according to this paragraph. In addition, shipments of limited quantities are not subject to subpart F (Placarding) of part 172 of this subchapter. Each package must conform to the packaging requirements of subpart B of this part and may not exceed 30 kg (66 pounds) gross weight. The following combination packagings are authorized:

Other Sections

(f) *Combustible liquids.* (1) A flammable liquid with a flash point at or above 38 °C (100°F) that does not meet the definition of any other hazard class may be reclassified as a combustible liquid. This provision does not apply to transportation by vessel or aircraft, except where other means of transportation is impracticable.

(2) The requirements in this subchapter do not apply to a material classed as a combustible liquid in a non-bulk packaging unless the combustible liquid is a hazardous substance, a hazardous waste, or a marine pollutant.

(3) A combustible liquid that is in a bulk packaging or a combustible liquid that is a hazardous substance, a hazardous waste, or a marine pollutant is not subject to the requirements of this subchapter except those pertaining to:

(i) Shipping papers, waybills, switching orders, and hazardous waste manifests;

(ii) The requirements of §173.200.

(viii) The requirements of §§173.1, 173.21, 173.24, 173.24a, 173.24b, 174.1, 177.804, 177.817, and 177.834 of this subchapter.

§ 173.202 Non-bulk packagings for liquid hazardous materials in Packing Group II.

(a) When § 172.101 of this subchapter specifies that a liquid hazardous material be packaged under this section, only non-bulk packagings prescribed in this section may be used for its transportation. Each packaging must conform to the general packaging requirements of subpart B of part 173, to the requirements of part 178 of this subchapter at the Packing Group I or II performance level (unless otherwise excepted), and to the particular requirements of the special provisions of Column 7 of the § 172.101 Table.

(b) The following combination packagings are authorized:

Outer packagings:

Steel drum: 1A1 or 1A2

Aluminum drum: 1B1 or 1B2

Metal drum other than steel or aluminum:
1N1 or 1N2

Plywood drum: 1D

Fiber drum: 1G

Plastic drum: 1H1 or 1H2

Wooden barrel: 2C2

Steel jerrican: 3A1 or 3A2

Plastic jerrican: 3H1 or 3H2

Aluminum jerrican: 3B1 or 3B2

Steel box: 4A

Aluminum box: 4B

Natural wood box: 4C1 or 4C2

Plywood box: 4D

Reconstituted wood box: 4F

PACKAGING FOR FLAMMABLE LIQUID (Non-bulk)



BULK PACKAGING



8000 Gallons Gasoline

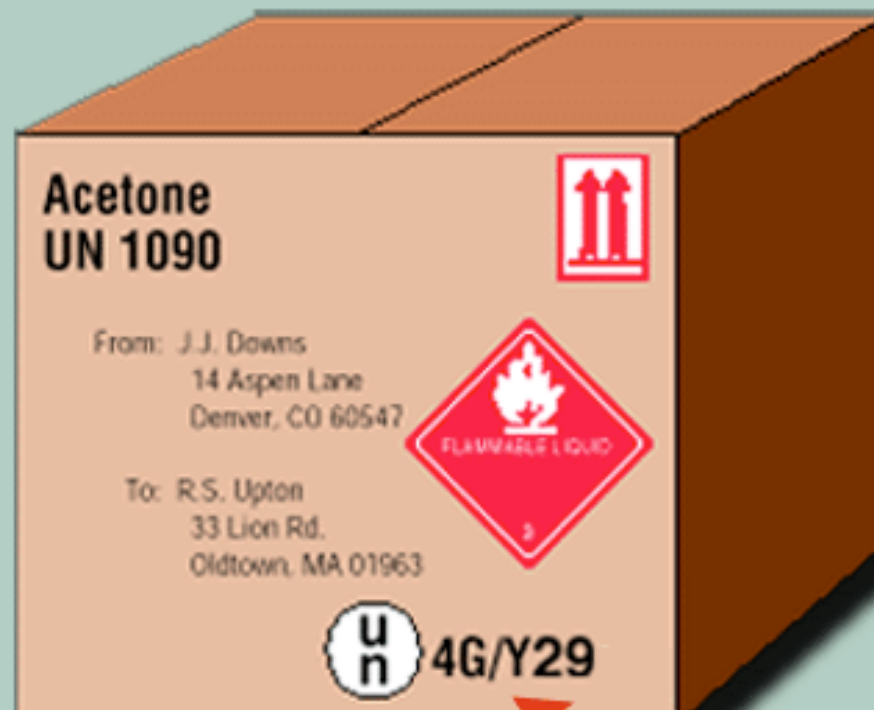
Select appropriate packaging

- ☐ **Check for quantity limitations**
- ☐ **Check other restrictions**
- ☐ **Modal restrictions**

§173.202 Non-bulk Packagings for Liquid Hazardous Materials in PG II

Must also comply with:

- General packaging requirements in Part 173**
- Requirements in Part 178 for PG I & PG II performance level**
- Applicable Special Provisions in HMT**



4G/Y29

Gross Mass

PACKAGING



UN - Meets 49 CFR

1A1 - Closed head steel drum

X - Tested to PGI

1.8 Specific gravity

300 - Test pressure in Kilopascals (kPa)

97 - Year of Mfg.

USA - Mfg. in USA to 49 CFR specs.

VL6 - Mfg. registered symbol

§172.101 HAZARDOUS MATERIALS TABLE

Sym-bols	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identification Numbers	PG	Label Codes
(1)	(2)	(3)	(4)	(5)	(6)
	Corrosive solids, n.o.s.	8	UN1759	I	8
	.....	.....		II	8
	.....	.....		III	8
	Corrosive solids, oxidizing, n.o.s.	8	UN3084	I	8, 5.1
	.....	.....		II	8, 5.1
	Corrosive solids, self-heating, n.o.s. ..	8	UN3095	I	8, 4.2

Corrosive solids, n.o.s.

NON-BULK PACKAGING - PG III

§172.101 HAZARDOUS MATERIALS TABLE

Identification Numbers (4)	PG (5)	Label Codes (6)	Special provisions (7)	(8) Packaging (§173.***)		
				Excep- tions (8A)	Non- bulk (8B)	Bulk (8C)
UN1759	I	8		None	211	242
	II	8	128	154	212	240
	III	8	128	154	213	240
UN3084	I	8, 5.1	B100	None	211	242
	II	8, 5.1	B100	None	212	242
UN3095	I	8, 4.2	B100	None	211	243

SPECIAL PROVISIONS

- Indicated in HMT, Col. 7**
- Explained in 172.102(a) and (b)**
- Listed in 172.102(c) Tables of Special Provisions**

Numerical

-Multi-Modal

Codes

Transported by: Only apply to:

A=Air

B=Bulk

H=Highway

N=Non-bulk

R=Rail

T=IM portable tanks

W=Water

PACKAGE REQUIREMENTS

- General - all hazardous material packages**
- Specific - certain hazardous materials**

GENERAL PACKAGE REQUIREMENTS

- Meet design construction criteria**
- Maintain package effectiveness**
 - No significant release of contents**
 - No reduction of effectiveness**
 - No mixture of gas or vapor**

FORBIDDEN

§172.101 HAZARDOUS MATERIALS TABLE

(8) Packaging (§173.***)			(9) Quantity limitations		(10) Vessel stow- age	
Excep- tions	Non- bulk	Bulk	Passenger aircraft/rail	Cargo air- craft only	Loca- tion	Other
(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
None	202	243	Forbidden	60 L	D	40
None	227	244	Forbidden	Forbidden	D	40

AIR SHIPMENTS



Must Meet:

- General packaging requirements - 173.24, 173.24a, 173.27
- Modal requirements - Part 175
- Performance requirements - Part 178

AIR SHIPMENTS



Prevent container leaks from

- **Altitude changes**
- **Temperature changes**

AIR SHIPMENTS (INNER CONTAINERS)



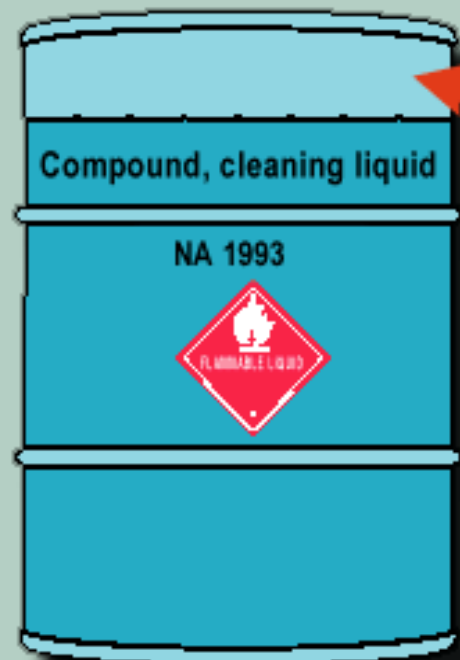
- **Closures secured and tight**
- **Sufficient absorbent material**
- **Leak tight packages, liner or leak proof bags**

AIR SHIPMENTS (CYLINDERS)



- Secure valve caps or headrings
or
- Crate or box cylinder
- Prohibited aboard aircraft:
 - Cargo tanks
 - Tank cars
 - Packages which vent gas

GENERAL REQUIREMENTS



**Outage
Vapor space**

**Packaging
must not be
liquid full**

GENERAL REQUIREMENTS

- Close tightly and securely
- Inner packaging must remain upright
- Provide cushioning when needed



SUMMARY

- **General packaging requirements (173.24)**
- **Additional - Non-bulk (173.24a)**
- **Additional - Bulk (173.24b)**
- **Transport by air (173.27)**

SMALL VS. LIMITED QUANTITIES



SMALL VS. LIMITED QUANTITIES

Small Quantities:

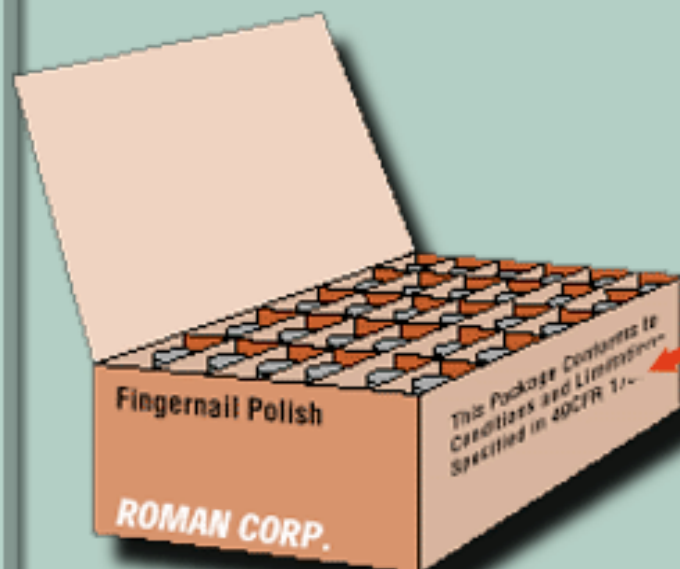
- Excepted from subchapter**
- Special packaging tests**
- Material and quantity limitations**

Limited Quantities:

- Inner container limits**
- Label/placarding exceptions**

Both are excepted from specification packaging

PACKAGING SMALL QUANTITIES



"This package conforms to 49 CFR 173.4"

or

"This package conforms to conditions and limitations specified in 49 CFR 173.4."
(may be used until 2001)

Gross mass must not exceed 64 lbs

AGRICULTURAL PRODUCTS



AGRICULTURAL PRODUCTS



03-46-10/99

AGRICULTURAL PRODUCTS

Compliance is required with:

Shipping Papers	- Subpart C
Marking	- Subpart D
Labeling	- Subpart E
Placarding	- Subpart F

MATERIALS OF TRADE

Definition:

- Protect health and safety**
- Support operation/maintenance**
- Support private motor carrier**

MATERIALS OF TRADE



Quantity Limitations Apply

MOTs PACKAGING REQUIREMENTS

- **Manufacturer's original packaging, or**
- **Equal or greater strength packaging**
- **Leak tight, sift proof**
- **Securely closed**
- **Secured against movement**
- **Protected against damage**

MATERIALS OF TRADE

Outer packagings not required

- Receptacles must be secured**
- Gasoline in DOT/OSHA approved cans**

MATERIALS OF TRADE

Operator must be informed:

- Presence of HM**
- Reportable quantity**
- Requirements in 173.6**

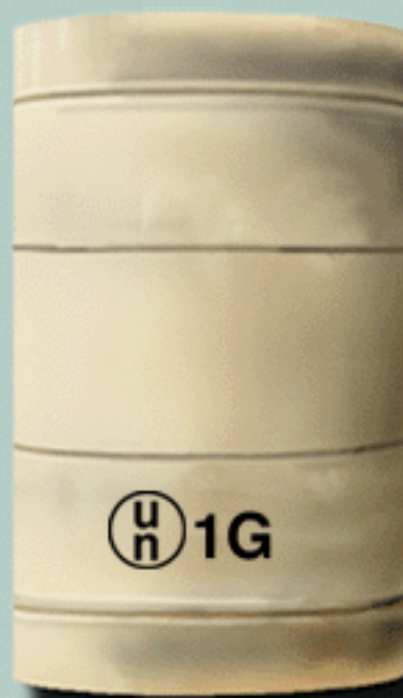
LAB PACKS

**Combination packaging (173.12)
and
Transported for disposal or recovery
Highway transportation only**

LAB PACKS OUTSIDE PACKAGING



Metal



Fiber



Polyethylene

LAB PACKS INSIDE PACKAGING

Maximum container capacity

- Glass-not over 4 liters (1 gallon)**
- Metal-not over 20 liters (5.3 gallons)**
- Plastic not over 20 liters (5.3 gallons)**

Liquid contents

- Compatible absorbent material**
- Able to absorb all contents**

PROHIBITED IN LAB PACKS

- Division 6.1, PG I or,
- Division 4.2, PG I, and
- These materials:

Bromine pentafluoride

Bromine trifluoride

Chloric acid

Oleum (fuming sulfuric acid)

LEAKING OR DAMAGED HM PACKAGES



Repackage in metal or plastic salvage drum

- Drum must have removable head**
- Drum must be compatible with the product**

SALVAGE DRUMS

- **Capacity 119 Gallons or less**
- **Packaging:**
 - UN standard drum (1A2, 1B2, 1N2, 1H2)**
 - Drum marked "Salvage Drum"**
 - Manufactured and marked before 10-1-93**

SALVAGE DRUMS



Sufficient, compatible material to:

- ☐ **Prevent excess movement
and**
- ☐ **Absorb all liquid**

SALVAGE DRUMS

Mark Drum

- ☐ **Proper shipping name**
- ☐ **Name and address of consignee**
- ☐ **Words "Salvage Drum"**

Label Drum

- ☐ **Identify hazard class**

SALVAGE DRUMS



Shipper must prepare shipping papers
Shipping papers must comply (HMR)

SALVAGE DRUMS



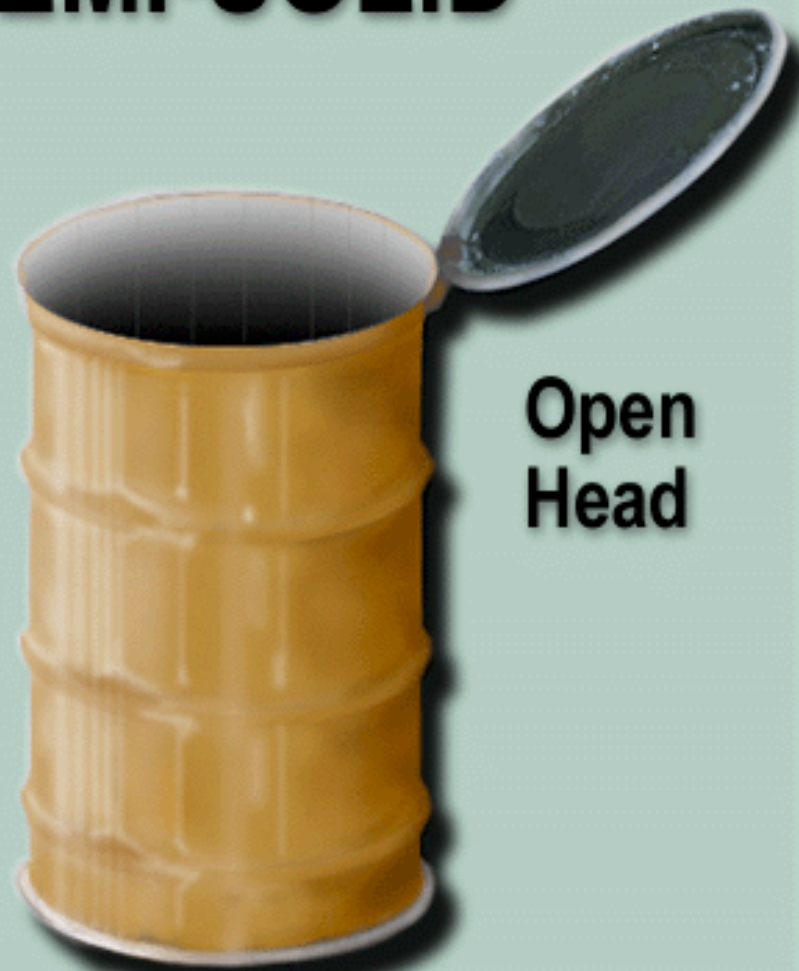
**Not
considered
an overpack**

PACKAGING HAZARDOUS WASTE (SOLID OR SEMI-SOLID)

**Closed
Head**



vs.



**Open
Head**

DOD PACKAGING

- Package in accordance with HMR
or**
- Use DOD certified packaging of
"Equal or Greater Strength &
Efficiency"**

RESHIPMENT OF DOD PACKAGES:

- By any shipper**
- To any consignee**
Provided packaging is:
 - Intact**
 - Unaltered**
 - Undamaged**

HAZARDOUS MATERIALS SOLD BY DOD

**Package not marked per HMR
requires DOD certification of
"Equal or Greater Strength &
Efficiency"**

DOD CERTIFICATION

Shipper must:

- 1. Obtain duplicate certification**
- 2. Provide copy to carrier**
- 3. Keep a copy for 1 year**

PACKAGING EXEMPTIONS



- Issued in writing by DOT
- Used by holder of, or party to, exemption
- Copy maintained at each facility and when offering occurs by each shipper

PACKAGES AND OVERPACKS



03-69-10/99

OVERPACKS



OVERPACKS

Place orientation arrows on two opposing sides

"Inside packages comply with prescribed specifications"



OVERPACKS PROHIBITED

For:

- ☐ **Division 5.1, PG I**
- ☐ **Class 8, PG I**

Poisons in Overpacks

- When transported with:
 - Foodstuff
 - Feed
 - Any edible material
- Overpack in UN1A2, 1B2 or 1N2 drums
- Drum must meet PG II or higher

REUSE OF PACKAGING (CONTAINERS, CYLINDERS, DRUMS & OTHER PACKAGINGS)

Containers:

- Use again provided...comply with HMR**
- Retested and reconditioned**

Markings:

- Remove/obliterate previous markings**
- "L" plus name or symbol of leak tester**
- "R" plus name or symbol of reconditioner**

EMPTY PACKAGING (PACKAGING CONTAINING A RESIDUE)

- Do not offer, unless**
 - Offered in same manner as previously required**
- Does not apply (may offer)**
 - When cleaned/purged**
 - Refilled with non-regulated material**

FORBIDDEN PACKAGES AND MATERIALS

§ 173.21 Forbidden materials and packages.

Unless otherwise provided in this subchapter, the offering for transportation or transportation of the following is forbidden:

(a) Materials that are designated "Forbidden" in Column 3 of the § 172.101 Table.

(b) Forbidden explosives as defined in § 173.54 of this part.

(c) Electrical devices which are likely to create sparks or generate a dangerous quantity of heat, unless packaged in a manner which precludes such an occurrence.

(d) For carriage by aircraft, any package which has a magnetic field of more than 0.00525 gauss measure

- Non- Compatible
- Unstable at 130° F or Less
- Evolve Excess Vapors
- Detonate in a Fire
- Fuel and Ignition Unit
- Magnetic Materials (AIR)

Packaging Must Be:



- Compatible with cargo
- Not permeable
- Non-bulk packaging manufactured to meet UN performance standards (after October 1, 1994)

A dark blue night sky filled with numerous white stars of varying sizes and brightness. A large, bright crescent moon is positioned in the upper right corner. The text "THE END" is centered in a bold, orange, sans-serif font with a black outline.

THE END

03-78-10/99